Health&Safety Manual

Supplement 26.07

LLNL Ergonomics Program

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LLNL Ergonomics Program*

Contents

1.0 Introduction

1.1 Policy

The LLNL safety policy is to take every reasonable precaution to protect the health and safety of employees. Implicit in the safety policy is the requirement to employ effective ergonomic practices when conducting Laboratory work.

1.2 Purpose and Scope

In furtherance of this policy, the Laboratory maintains an ergonomic prevention program. Components of this program include information awareness, work area evaluation, use of appropriate equipment, education, and counseling. The Laboratory also provides formal diagnostic and treatment services, and maintains a database of ergonomic-related injuries and illnesses.

Ergonomics means fitting the workplace to workers and examining the interaction between workers and their environment. Application of ergonomic principles can reduce the risk of injuries or illnesses for those who work with computers, in laboratories, in jobs that typically involve repetitive activities, or in jobs with heavy physical requirements. Ergonomics draws from a wide range of disciplines such as medicine and engineering.

This supplement describes the LLNL Ergonomics Program, basic ergonomic principles, and the resources available to management and employees for preventing and resolving ergonomic problems. The focus of this supplement is on upper extremity injuries and illnesses and office ergonomics. Prevention of low back injuries is addressed in Chapter 29 (Material Handling) of the *Health & Safety Manual*.

1.3 Requirements/Regulatory Summary

The Department of Energy (DOE) Order 5480.10 (Contractor Industrial Hygiene Program) requires the establishment of a program that identifies, evaluates, and controls ergonomic stressors. The Occupational Safety and Health Administration (OSHA) is drafting regulations for the control of workplace ergonomic factors.

The requirements in this supplement are based on ANSI/HFS 100-1988, "Human Factors Engineering of Visual Display Terminal Workstations," which was developed by the American National Standards Institute in 1988.

1.4 Applicability

The LLNL Ergonomics Program and services described in this supplement are applicable to all persons who perform LLNL work. Contract employees and visitors are fully covered by the preventive measures in this supplement. However, they will only receive urgent care from the Health Services Department if there is a medical problem.

2.0 Responsibilities

2.1 Managers

Managers at all organizational levels are responsible for implementing ergonomic-related health and safety policies. In addition, they shall

- ensure that ergonomics are considered when conducting hazard or risk assessments and root-cause analyses;
- support corrections to ergonomic problems by ensuring that the proper education and resources are available to supervisors and employees;
- ensure that programs are in place to evaluate the workplace for proper ergonomic practices and conditions;
- maintain a sufficient number of trained ergonomic evaluators to conduct computer workstation evaluations; the availability of a trained individual in the work area allows for performing simple workstation evaluations and resolving complicated problems in a timely and cost effective manner; and
- ensure that new furniture purchased for employee workstations have adjustment flexibility and comply with the 1988 ANSI standard.

2.2 Supervisors

Supervisors shall ensure that employees receive appropriate ergonomics education (see Section 4.0). In addition, they shall

- assure that the work environment is appropriately evaluated for proper ergonomic practices and conditions;
- make ergonomic evaluations a part of ongoing workplace assessments;
- apply ergonomic principles when workplace changes are being considered;
- respond to employees' concerns regarding ergonomic problems;
- seek assistance from the Hazards Control Department, Health Services Department, and Plant Engineering when necessary;

- conduct computer workstation evaluations, if qualified to do so;
- implement ergonomic recommendations, as necessary, in consultation with the Hazards Control Department and/or Health Services Department;
- promptly refer all injured or ill employees to the Health Services Department;
- send illness and injury reports for both LLNL or contract employees to the Health Services Department or Hazards Control Department; and
- ensure that employees who engage in intensive, highly repetitive work (as defined in Section 3.3.4) have the opportunity for frequent, short alternate work activities.

2.3 Ergonomic Evaluator

The ergonomic evaluator is normally someone from the directorate or department who shall

- maintain the appropriate skill level to solve simple workstation ergonomic problems;
- conduct workstation evaluations in specific work areas, as assigned;
- refer complicated workstation evaluations to a Hazards Control Safety Engineer;
- provide educational material and serve as a work area informational resource person;
- refer employees complaining of pain or discomfort to the Health Services Department; and
- send copies of workstation evaluations to the Technical Support and Policy Development (TSPD) Division, L-384.

2.4 Employees

Employees shall promptly report ergonomic problems (see Section 3.1) to their supervisors and the Health Services Department. Prompt implementation of workplace changes can significantly reduce the potential for severe injuries or illness. Employees shall also follow ergonomic recommendations.

2.5 Hazards Control Department

The Hazards Control Department shall

- provide guidance on modifying the workplace to minimize the potential for injuries and illnesses;

- provide information about ergonomic issues to increase the awareness of employees, supervisors, and managers;
- analyze injuries and illnesses to determine potential ergonomic causes;
- maintain workstation evaluations and ergonomics records;
- evaluate individual workstations, as requested by management;
- evaluate and advise employees and supervisors on the selection of ergonomically sound workstation furniture and equipment, as requested by management; and
- assist supervisors, if necessary, in determining which employees require education and/or alternate work activities.

2.6 Health Services Department

The Health Services Department provides diagnosis, treatment, and comprehensive medical management of cumulative trauma disorder (CTD) and acute strains to the musculoskeletal system. It also provides preplacement and periodic physical exams. These examinations allow for identification of medical risk factors that may contribute to the development of ergonomic injuries, as well as early identification of other injuries or illnesses.

2.7 Plant Engineering

Employees and supervisors who are planning to design or redesign their work areas will receive an evaluation and advice from Plant Engineering on the selection of ergonomically sound workstation furniture.

2.8 Risk Management Office, Human Resources

The Risk Management Office provides management oversight of all Workers' Compensation claims processing, medical treatment/services costs, and other related Workers' Compensation costs.

3.0 Process for Minimizing Ergonomic Hazards

3.1 Identifying a Possible Ergonomic Problem

Many ergonomic disorders are felt as strains and sprains. Acute or chronic muscle strain can be an indication that the capacity of the body to accommodate stress has been exceeded. Acute muscle strain occurs when a

concentrated episode has overstressed the musculoskeletal system. Chronic strain and CTD result from less intense stresses that accumulate over a period of time thus reducing the rate of recovery of the musculoskeletal system. Table 1 describes some CTD disorders and their symptoms.

3.1.1 Acute Muscle Strain

The signs and symptoms of acute muscle strain generally may include pain within 24 hours of an injury to the musculoskeletal system. This pain may be over the muscle or, in the case of low back injury, might radiate down the leg. Recurrent muscle strain as a result of repetitive work activities can lead to the development of CTD.

Table 1. Common cumulative trauma disorders.

Injury	Symptoms
Carpal tunnel syndrome	**Caused by too much pressure on the median nerve which runs through the wrist. Early symptoms include numbness or tingling and burning sensations in the fingertips. An aching sensation and wrist pain (mostly at night) are also typical in many cases.**
Tendinitis	**The tendons of the hands and wrists can become inflamed from overstretching or constriction. Symptoms include pain, tenderness, swelling, weakness of the hand or shoulder, and even redness of the hand or wrist.**
Tenosynovitis	**An inflammation of the tendon and the sheath that covers it. Symptoms include swelling, tenderness, and pain in the hand or arm.**
Epicondylitis	**Also known as tennis elbow. This condition is due to inflammation of the tendons in the elbow. Symptoms include pain with some swelling and weakness.**
Trigger finger	**This condition results when the tendon sheath is sufficiently swollen causing the tendon to lock in the sheath. A snapping and jerking movement occurs when attempting to move the finger.**
Rotator cuff injury	**Occurs when one or more of the four rotator cuff tendons in the shoulder is inflamed. Symptoms include pain and limited movement of the shoulder.**
DeQuervain's Disease	**The progressive constriction of the tendon sheath. This disease affects the tendons on the side of the wrist and at the base of the thumb. Symptoms include pain and difficulty in movement.**
White finger	**Also known as vibration syndrome or Raynaud's Phenomenon. The disorder occurs when blood vessels in the fingers are damaged, especially due to the use of vibrating tools in cold weather. Symptoms include paleness in the fingers, tingling, and a sense that the finger is "on fire."**

Most acute muscle strain injuries can be prevented. The keys to preventing injuries are

- use of proper body mechanics;
- use of mechanical devices or additional personnel when lifting and moving heavy loads;
- establishment of limits for lifting heavy objects; and
- avoidance of excessive fatigue from repeated forceful activities;
- physical conditioning.

3.1.2 Cumulative Trauma Disorder

The signs and symptoms of CTD of the upper extremities include pain; numbness; or tingling of the fingers, wrist, elbow, or shoulder. Chronic back and neck problems may result in pain, numbness, or tingling that radiates to the arms or legs, as well as limited back motion. These problems can usually be prevented by doing the following:

- Using ergonomically designed tools and workplaces (i.e., providing furniture that has adjustment flexibility and allows for proper posture).
- Educating employees to adhere to ergonomically appropriate work habits (i.e., maintaining the proper posture, using a light touch when doing keyboard work).
- Varying physical activities appropriately to allow tendons and muscles frequent, short rest periods during which they are not subjected to repetitive strain or sustained contraction (see Section 3.3.4.)
- Assessing, intervening, and evaluating symptoms early. Early intervention is essential to quick recovery and long-term prevention of CTD.

It is extremely important for employees to report any recurrent symptoms of CTD (pain, numbness, tingling, or tenderness) to the Health Services Department. Employees should also notify their supervisors of these symptoms and request a workstation evaluation.

3.2 Workstation Evaluation Procedure

Supervisors are responsible for ensuring that employees' workplaces are properly configured. But an employee with a concern may request that a supervisor arrange a workstation evaluation.

In general, workstation evaluations should be completed by the work area ergonomic evaluator assigned by the manager. The education needed to fulfill the role of a work area ergonomic evaluator is defined in Section 4.0. The evaluation shall assess the physical configuration of the workstation (see Section 3.3) and assist employees in identifying risk-related work habits.

The work area ergonomic evaluator will complete an Ergonomic Evaluation Form (see Appendix A), review it with employees and/or their supervisor, and give both of them a copy. A copy of the form shall also be sent to the TSPD Division, Hazards Control Department (L-384), and the Health Services Department (L-723). If a health problem is noted, the employee shall report to the Health Services Department.

If necessary, employees and their supervisors shall make furniture adjustments and order furniture or other equipment to resolve problems identified during the evaluation. All workstation furniture purchased after issuance of this supplement will comply with the 1988 ANSI standard.

If the work area ergonomic evaluator is not available or cannot resolve a concern, or if the employee has medical symptoms, the supervisor should contact the Hazards Control Safety Engineer so that he/she can perform the evaluation.

3.3 Ergonomic Design and Practices

3.3.1 Computer Ergonomics

A frequent contributor to CTD is improper configuration and use of computer workstations. Changes to a workstation may only require repositioning furniture or equipment or purchasing ergonomically appropriate replacements. Figure 1 shows a well-designed computer workstation. In addition, some key items of a properly designed computer workstation are given in this section and should give employees a general idea of how to correctly set up their workstations. Plant Engineering is also available to assist in the planning and design or redesign of work areas.

Chairs. Chairs should have an adjustable back that will provide support for the lumbar region of the back and trunk. They should be easily adjustable in height to permit the feet to rest flat on the ground with the legs parallel to the floor. A footrest may be needed by some people to achieve this position. Chairs should have a five-star base and casters compatible with the floor surface. Armrests are recommended and should also be adjustable in height. The seat pan should be large enough to be comfortable.

Work surfaces. Work surfaces should be large enough to accommodate all the computer equipment, including a wrist rest in front of the keyboard. A keyboard tray can be used to increase depth. There should also be enough room under the work surface to allow free leg movement. The height of the work surface should allow the forearms to be parallel with the floor while working at the computer.

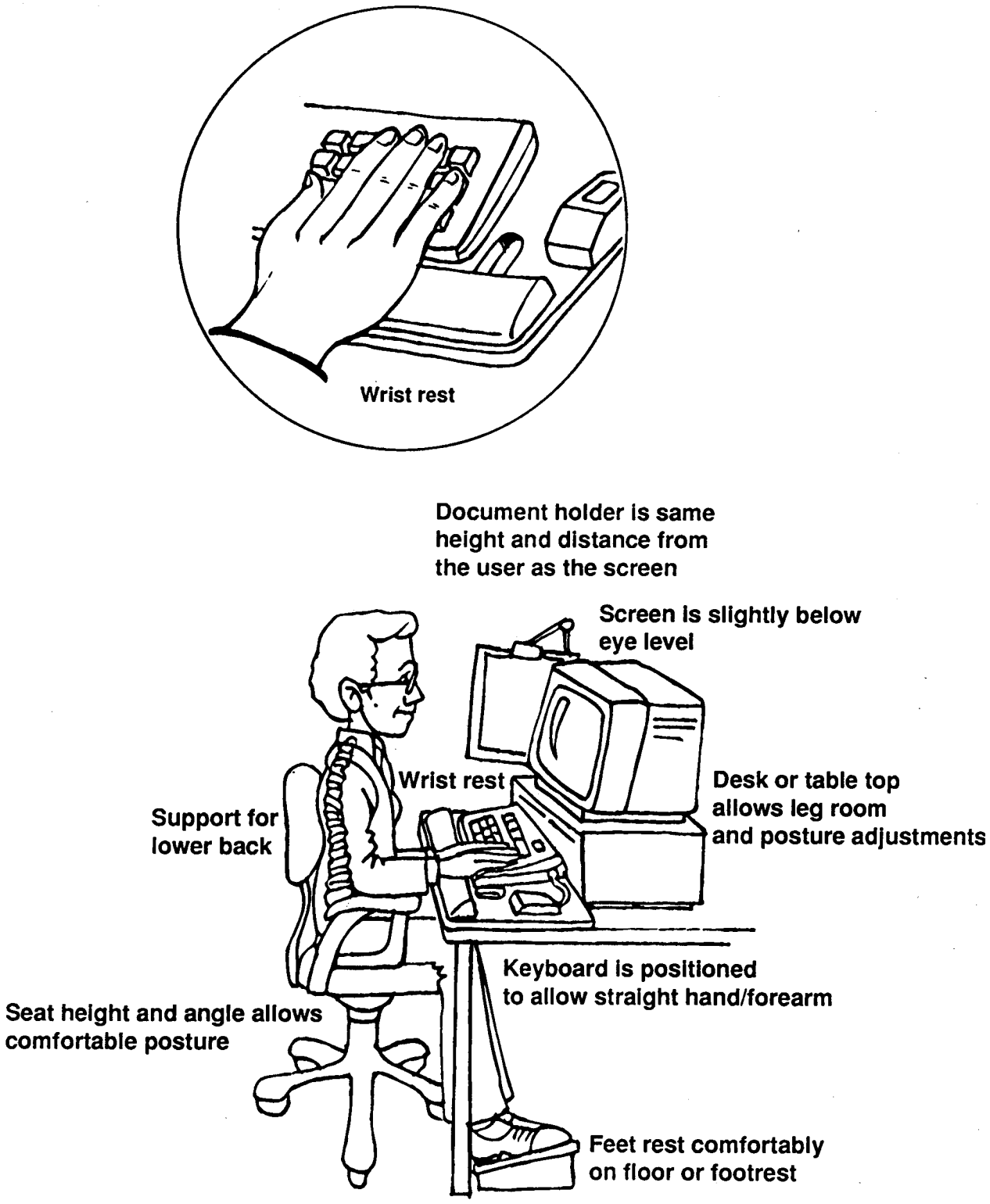

Figure 1. A well-designed computer workstation.

Keyboard/Input Device. The keyboard and input device (mouse or trackball) should be at the same level and in front of the operator. The height of the keyboard and input device should allow operators to position their forearms and hands parallel to the floor during operation. This can be achieved by adjusting the height of the chair and/or table, or by using an adjustable tray. A wrist rest for the keyboard and input device should be used to prevent the operator's wrists from coming in contact with the work surface when the arms are at rest.

Terminals. Terminals (monitors) should be located directly in front of the operator, and the screen should be approximately at eye level or slightly lower.

Vision. Although often overlooked, vision is a critical part of the workstation composition. An annual eye examination is recommended to ensure that any changes in vision are detected and corrected. The viewing distance should be about an arm's length from the monitor, and operators should periodically look away from the computer to a distant object to relax the eye muscles. The Safety Glasses Office (B-663) will provide special single-vision glasses (computer glasses) at no cost to employees who work at computers for more than two consecutive hours or for more than four hours a day.

Lighting/glare. The monitor should be positioned in a location where window light does not reflect off the screen. Blinds, drapes, or glare screens may be used to reduce glare. Light bulbs can be removed from light fixtures to reduce brightness.

3.3.2 Hand Tool Ergonomics

Below are some key points to remember when selecting or purchasing hand tools to prevent CTD.

- Avoid tools that produce a bent wrist position. The ideal wrist position is neutral (i.e., keeping the wrist straight while performing the work). Figure 2 shows the correct position of the wrist when using hand tools.
- Select hand tools that fit the employee's hands (see Fig. 3). A tool that is too large or too small will produce stresses in the hand and wrist. As a general rule, the ideal handle diameter for a man is 1.5 in. and 1.3 in. for a woman.
- Do not grasp tools so large that they are difficult to hold.
- Select power or pneumatic tools with built-in vibration dampening (see Fig. 4).

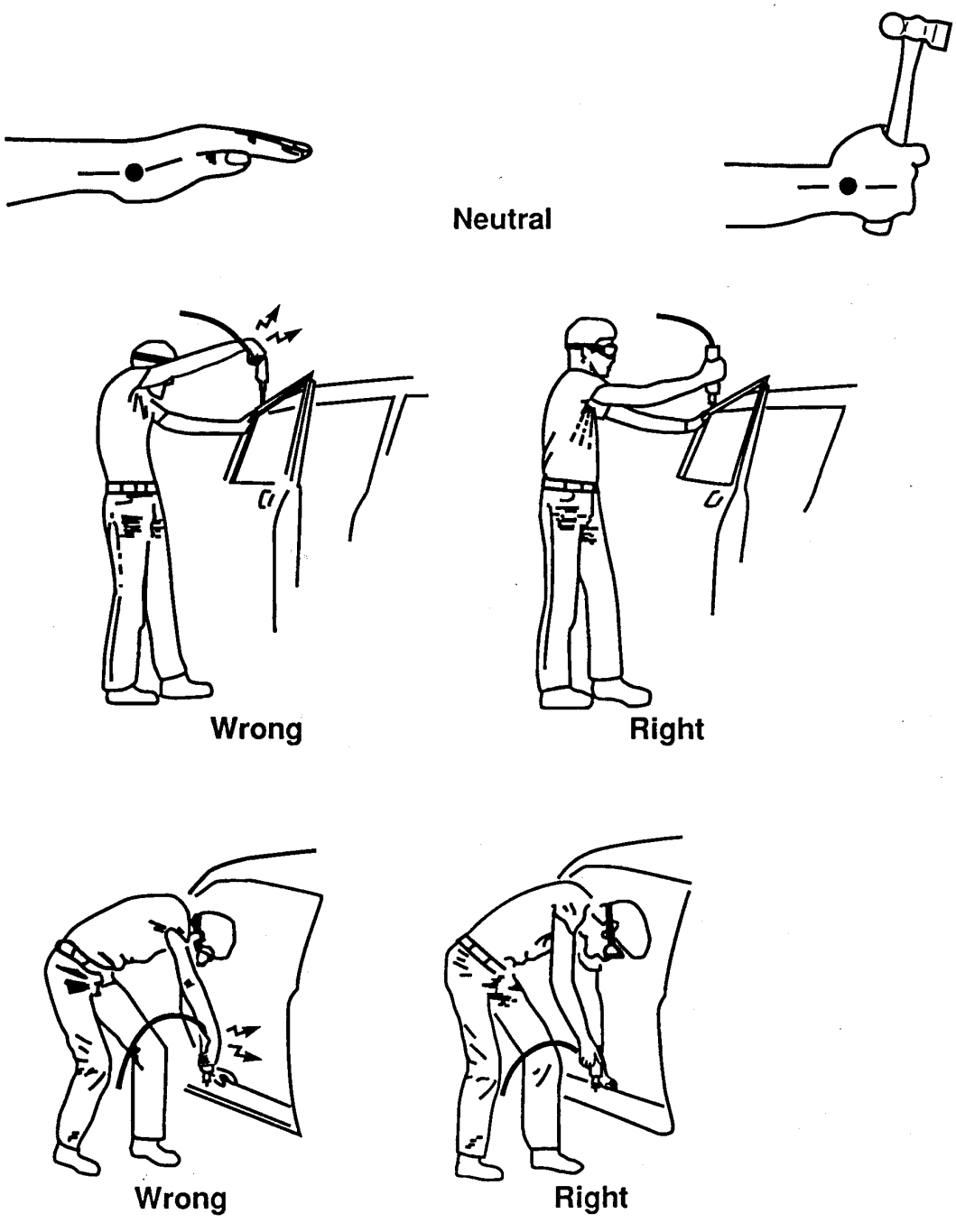

Figure 2. Correct positions for holding hand tools.

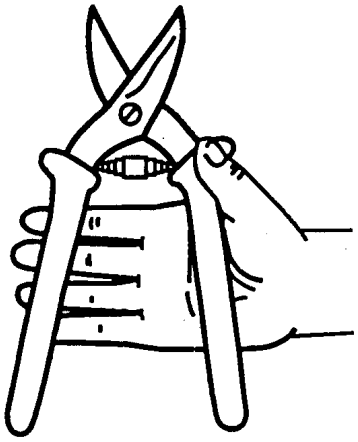

Figure 3. Reasonable hand grip for tool.

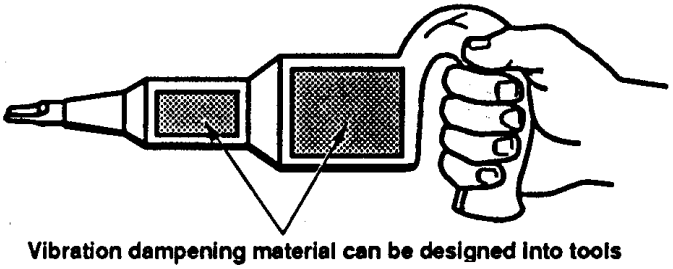

Figure 4. Power or pneumatic tool with built-in vibration dampening.

- For tools that are activated by a trigger, choose a grip size that allows activation with the middle part of the fingers. Activation with the fingertips can create nodules on nerve sheaths and cause the CTD known as trigger finger.
- Use a soft covering on a tool handle to protect the hands from heat and cold and to help reduce pressure points, vibration, and slipperiness of the grip. This covering encourages a more relaxed hold on the tool (see Fig. 5).

For more information on hand tools, take course HS5311, "Ergonomics—The Selection and Use of Hand Tools." See the *LLNL Course Catalog* for more details.

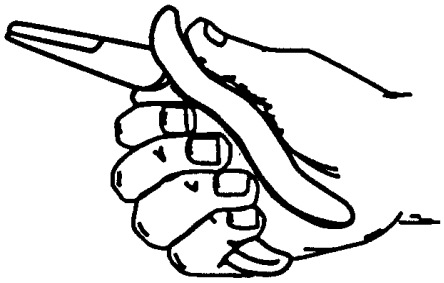

Figure 5. Soft covering for tool handle.

3.3.3 Other Workplace Ergonomics

In addition to computer workplaces, there are many other work settings (e.g., material fabrication, circuit-board fabrication, painting, gardening, and custodial work) where ergonomic practices are important and the effects of CTD are evident. The list below provides some basic ergonomic guidelines that may help avoid the effects of CTD.

- Respect pain. Stop or change positions if the activity is causing pain.
- Alternate tasks during the workday to interrupt repetitive activities.
- Alternate activities throughout the day, if possible.
- Keep the wrists in the neutral position as much as possible.
- Use two hands whenever possible—even when handling light objects or doing small tasks.
- Make several trips with lighter loads. Use a cart or dolly, if necessary.
- To avoid use of a sustained forceful grip, use a vice, clamp, or jig to stabilize objects.

Back injuries represent a significant number of CTD cases. Thus, it may be necessary to review Chapter 29 (Material Handling) of the *Health & Safety Manual* for detailed guidance on lifting and moving objects.

3.3.4 Alternate Work Periods

Employees who have the highest risk of developing CTD include those who perform continuous, high-intensity, repetitive tasks that cause stress on the same body parts. An alternate work activity totaling 5 minutes for every 30 minutes of work is necessary for these individuals. Alternate activities allow the muscles and tendons time to recover from repetitive motion tasks. They do not include repetitive motion activities such as keyboarding, use of hand tools and floor buffers, material handling, or other similar work. If necessary,

Hazards Control Safety Engineers are available to assist supervisors in determining which employees fit into this high-risk category. This requirement does not apply to individuals whose activities include regular interruptions involving substantial pauses in activity.

A time-monitoring program (LifeGuard), which can be programmed to remind Macintosh users to do alternate work, is available through Open LabNet.

3.4 Health Services Department Ergonomic Management

Employees with symptoms of acute injuries to the musculoskeletal system or CTD (or early signs of CTD) are required to promptly report to the Health Services Department for an evaluation and, if needed, treatment.

The Health Services Department provides the following services:

- Diagnosis, treatment, and comprehensive management of acute musculoskeletal injuries and CTD.
- Preplacement (at the time of employment or job reassignment) and periodic physical exams to identify medical risk factors that may contribute to the development of ergonomic injuries and determine injuries or illnesses early.
- Worksite assessments, if necessary, in collaboration with the Hazards Control Department. Worksites from which injuries or illnesses have arisen have the highest priority.
- Written "Return to Work" evaluations of all employees who are injured or become ill to determine if they should resume regular work or be placed on restricted work duties.
- Medical case management of employees who sustain chronic ergonomic-related injuries. This may include diagnostic testing and a treatment plan, including physical therapy and physical strengthening, if indicated.

For more information about the medical services offered for ergonomic injuries, contact the Health Services Department.

3.5 Recordkeeping

Records of workplace evaluations performed by a work area ergonomic evaluator or safety engineer shall be sent to the TSPD Division, L-384. The Hazards Control Department maintains a database that includes information relevant to ergonomic injuries and illnesses and records of workstation evaluations. The Health Services Department maintains employees' medical records, which are confidential.

3.6 Program Evaluation

The LLNL Ergonomics Program is evaluated periodically by the Hazards Control and Health Services Department Heads to determine if the objectives are being met and revisions to the program are necessary. The program's objective is to reduce the severity, frequency, and lost and restricted work time that occur as a result of ergonomic injuries and illnesses. These are the indicators that are monitored and evaluated.

4.0 Education and Training

Education and training are key aspects to the LLNL Ergonomics Program. Supervisors and employees should receive sufficient information and education to recognize ergonomic risk factors, to understand the nature of ergonomic injuries and illnesses, and to be aware of potential corrective measures and the resources available. Ergonomic evaluators and individuals assigned to continuous high-intensity, repetitive tasks which repeatedly stress the same body parts without interruption for 4 hours or more a day **must** receive education and training from among the courses listed below (see also Section 3.3.4, "Alternate Work Periods").

The following classes are available:

- HS5300, "Back Care Workshop"
- HS5310, "VDT Ergonomics"
- HS5311, "Ergonomics—The Selection and Use of Hand Tools"
- HS5312, "VDT Ergonomics for Supervisors/Evaluators—Basic"
- HS5313, "Ergonomic for Evaluators—Advanced"

These courses cover the following:

- The kinds of activities that may result from physical stress and, over time, can create musculoskeletal disorders.
- The medical symptoms associated with acute musculoskeletal injuries and CTD.
- The methods for recognizing work that presents ergonomic risk factors. These measures are relatively simple and can lessen the potential for ergonomic stresses and acute musculoskeletal injuries.
- Procedures for requesting a work assignment or workstation evaluation from an ergonomic evaluator.

For more specific details on the above courses, refer to the *LLNL Course Catalog*. All completed training must be entered into the Laboratory Repository of Completed Courses (LROCC).

5.0 LLNL Contacts

For further information on the topics below, contact the following as necessary:

- ES&H Team Leader—ES&H concerns or questions
- ES&H Team Safety Engineer—Workplace evaluations
- Health Services Department, ext. 2-7459—Medical evaluations
- Industrial Safety, Hazards Control Department, ext. 2-1322—Ergonomic-related illnesses and injury statistics and records
- Safety Training, Hazards Control Department, ext. 2-5158—Training information and registration
- Plant Engineering, ext. 3-7000—Consultation for planning and designing or redesigning work areas
- Risk Management Office, Human Resources, ext. 3-7166—Workers Compensation Claims Processing

Appendix A

Ergonomic Evaluation Form